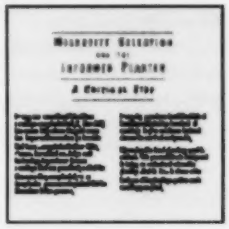
Microsite Planting Presentations

As a treeplanter, you are an important link in the reforestation process. Every day, you have the difficult job of handling and planting hundreds of seedlings to give each one the best chance for survival and growth.

These presentations are designed to help you understand microsite planting—that is, how to choose the best possible planting spot for each seedling you plant.

The presentations are available in PDF format for download or online viewing:

Introduction — Choosing the best planting spot is critical. This presentation is designed to help you understand microsite planting—that is, how to choose the best possible planting spot for each seedling you plant.

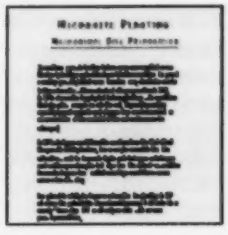


Link to presentation in PDF Format

Microsite Planting Seedling Requirements And Growth Limiting Factors — Trees have certain requirements to grow well. The closer the spot they are planted in comes to providing those requirements, the better off the trees will be. When conditions are just right, trees can grow very well indeed.

Link to presentation in PDF Format

Microsite Planting: Mechanical Site Preparation — Sometimes, growth limiting factors are so severe that even the best planting spots do not provide the conditions for good seedling growth. In that case, foresters may decide to create better microsites with mechanical site preparation (MSP). MSP is done after logging but before planting, with machines that dig, plow, scrape, or mix the soil.



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MICROSITE SELECTION AND THE INFORMED PLANTER

A CRITICAL STEP

Every year, more than 200 million seedlings are planted in B.C. Our ability to successfully reforest logged areas has improved tremendously since the first trees were planted in the 1930s. We now have the knowledge and technology to produce vigorous seedlings that are genetically suited to the areas they are planted. As a treeplanter, you are an important link in the reforestation process.

Every day, you have the difficult job of handling and planting hundreds of seedlings to give each one the best chance for survival and growth.

Choosing the best planting spot is critical. This presentation is designed to help you understand microsite planting - that is, how to choose the best possible planting spot for each seedling you plant.

WHAT IS MICROSITE PLANTING?

Microsite planting is thinking about and selecting the ***best*** location to plant the seedling.

A microsite is a spot within a small area of the landscape. The treeplanter in this illustration is aware of small differences in topography, planting materials, and vegetation.

Within the confines of the spacing rules, there are many choices about where to plant each seedling. You could choose to plant on mounds, in depressions, beside stumps, under bushes, in mineral soil, or in rotten logs.

Each of these microsites would provide different growing conditions for the seedling and the planter must use their knowledge of the requirements for seedling growth to choose the best one.

Planting the best microsite does not have to slow you down!

This is not the intention.

As a treeplanter, you work extremely hard for your money, and every movement counts. Choosing the best microsite does not have to slow you down. Very often, the best microsites are the easiest to plant, and once you know what you are looking for, the process will become second nature.

Easier planting=faster planting=less down time

☆ Same Site ☆ Same Species ☆ Same Stock Type

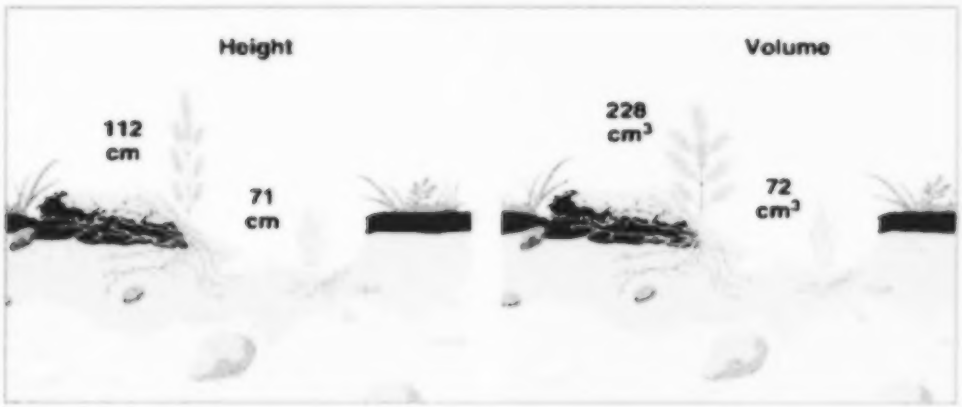
These trees are both 15 years old.

The Difference — Microsite!

Here is another example of the difference good microsite selection makes. **Both** these trees are 15 years-old. The difference is that the tree on the left was planted in dense shade under a black twinberry bush and the one on the right was planted in the open.

The extra thought and effort you take to select a good microsite will greatly benefit the forest that will follow.

The facts are in about microsite effects.



Year 5 Results – Tanli Lake Trials
Vanderhoof Forest District

Good microsite selection can have a large and lasting effect on how well seedlings grow – or even whether they survive at all! In this example, the seedlings planted on the side of the trench are about 1½ times taller than those in the bottom, and they have over twice the stem volume.

Microsite selection makes a difference!

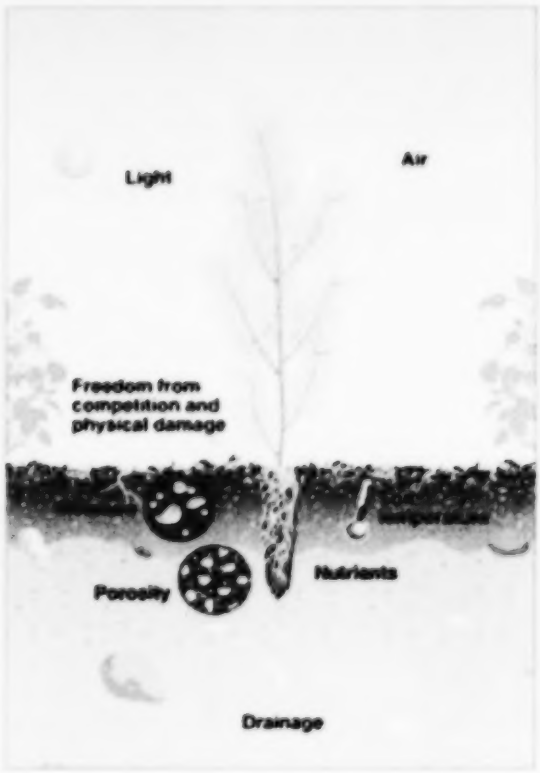
MICROSITE PLANTING

SEEDLING REQUIREMENTS AND GROWTH LIMITING FACTORS

Trees have certain requirements to grow well. The closer the spot they are planted in comes to providing those requirements, the better off the trees will be. When conditions are just right, trees can grow very well indeed. For instance, on a rich site near sea level on Vancouver Island, this Douglas-fir grew 1.5 m taller in a single year! Of course, not every site has this kind of potential, but we still try to choose the spot that will provide the tree with as many as possible of its growth requirements.

Microsite planting means choosing a spot that has most of the good things seedlings need.

Conditions Important for Seedling Survival and Growth



Conditions above-ground and below-ground both affect how well trees will grow. Its easier for us to understand what is going on above-ground because we can see it, but the soil environment is just as important. This illustration shows some of the conditions that are important to seedlings, and which we will discuss in detail.

Above ground

- Light
- Air
- Freedom from competition and physical damage from other plants

In the soil

- Moisture
- Nutrients
- Temperature
- Drainage
- Porosity

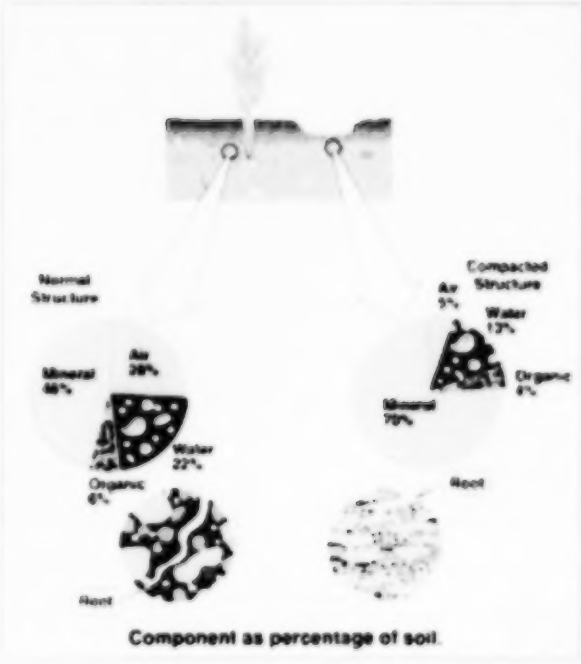
Few sites offer all the good conditions in ideal amounts. Some sites lack a particular condition so much that it limits seedling survival and growth. This is called a **growth limiting factor**.

Soil – The Growing Medium

Soil is often poorly understood, but it is home to thousands of organisms and is critical to the growth of trees. Forest soil usually consists of a layer of forest floor material over mineral soil.

When mineral soil has good **structure**, it is easy for seedling roots to grow, and water and nutrients can move through the soil to the roots. In a soil with normal structure, only about half the volume is actually solid material. The other half consists of small pore spaces. Pore spaces are important because roots don't actually penetrate solid material; rather, they grow in these tiny pore spaces between the soil particles, gradually pushing them apart as they get larger.

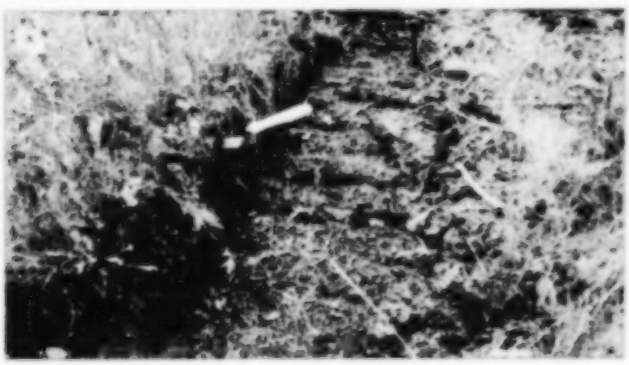
Ideally, about half the pore spaces are filled with water and the other half are filled with air. Both water and air are necessary for seedlings to grow. We all know plants need to absorb water to grow, but they also need oxygen in their rooting environment so that cellular processes can be carried out. If soil is compacted, - for example, at the bottom of a heavy equipment tire rut, it looses its good structure.



Component as percentage of soil.

In the compacted soil, pore spaces have collapsed to less than one-quarter of the soil volume. This means the soil can hold less water and air, and root growing tips have a harder time forcing their way through the material.

Compaction degrades soil structure.



Here's another photo and illustration to show what happens when soil becomes compacted by heavy equipment. Ruts are great for walking in, but seedlings do poorly when they are planted into the compacted soil. From a microsite perspective, it would be much better to plant in the uncompacted ground a few inches away from the rut.

Sometimes you may be specifically asked to plant on old skid trails or landings to aid in their rehabilitation, but only do so if you are asked.

Where will roots grow best?

Roots will only grow in a favorable environment!

Soil temperature is also a critical factor for seedling growth - seedlings grow best when it is not too cold and not too warm. The photograph shows an experiment where seedlings were grown in different temperature soils, and it is easy to see that the seedlings with their roots growing in 20°C soil are the biggest. If we could see the root systems we would see that they are also largest at 20°C.

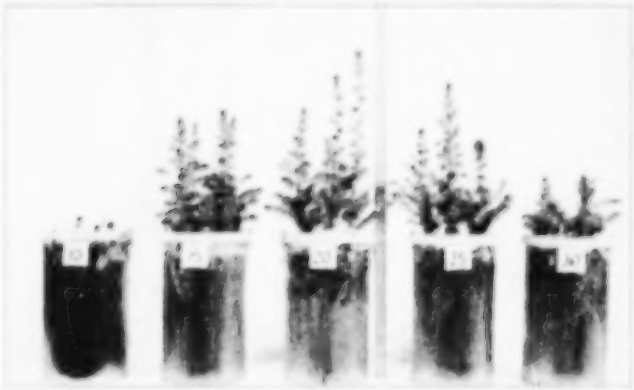
In northern B.C., cold soils are probably the most important **growth limiting factor**. In many areas, soils are only above 10°C for a short period every summer.

On sites with cold soils, the warmest microsites are mounds or high spots. There are several reasons for this. First of all, high spots are well drained, and when there is less water in the soil it takes less heat energy to warm it. Mounds are also warmer than flat spots because they have more surface area to absorb the sun's radiation. This means that snow melts earlier in the spring and the soil can warm more quickly around seedling roots.

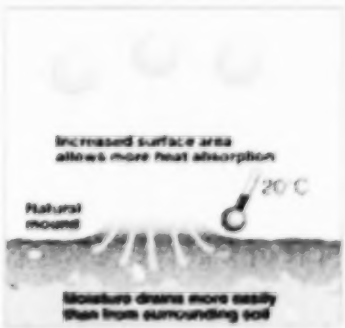
High spots are warmest!

Depressions are coolest!

Soil temperature has a significant effect on seedling growth.



Soil Temperature (°C)



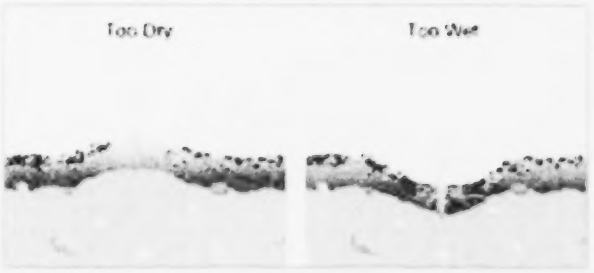
In some dry areas of the southern interior, soil temperatures can be much warmer than 20°C in the summer, especially when the site faces south. On those sites, the best microsites may be shady spots behind logs or bushes, or depressions.

Soil water is often a critical problem.

Soil water is often an important growth limiting factor to seedlings. We know that seedlings can die without enough water, but too much water can be just as bad. Not only do really wet soils take a long time to warm up, they also lack oxygen for root growth. That's because all the pore spaces are filled up with water.

Thinking back to the diagram about soil structure, the ideal soil had about half the pore spaces filled with water and the other half filled with air. On wet sites, the best microsites are high spots or mounds because the excess water drains away. Avoid depressions where water collects.

On dry southern sites, the best microsites may be the depressions, because water will be available to the seedling for a longer period during the summer.



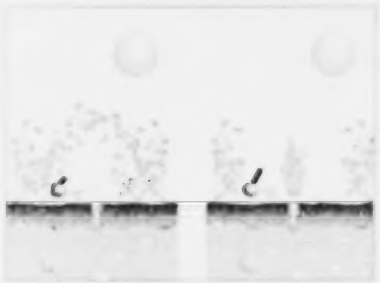
Moisture conditions vary from place to place in B.C., and when you are only planting on a site for a few days, its not always obvious whether moisture is a growth limiting factor. Usually your supervisor will talk about this during the pre-work conference, and if you are in doubt, ask.

Moisture conditions vary from site to site and change during the year.

Excess brush or grass competes for sunlight, soil moisture, and soil nutrients

Competition from other plants can reduce the growth of young seedlings or even kill them. Many kinds of plants grow faster than conifer seedlings and they can create dense shade or use up most of the available water and nutrients. Vegetation can also cause physical damage to seedlings when it sheds its leaves or collapses in the fall.

Its important to remember that sites that are the most productive for seedling growth are also the best for brush. On these types of sites the best microsites are open spaces away from dense patches of vegetation. Sometimes you may also be asked to plant next to stumps or logs, so that seedlings have less chance of being crushed by vegetation and heavy snow during the winter.



Soils that are most productive for seedlings = most productive for brush.

Few sites offer all the good conditions in ideal amounts.

Some sites lack a particular condition so much that it limits seedling survival and growth. This is called a

GROWTH LIMITING FACTOR.

Good microsite selection is about planting seedlings where they can best overcome growth-limiting factors. These factors vary from place-to-place in the province, and so will the characteristics of a "good" microsite. Being aware of the principles behind microsite planting, however, will help you understand why you may be asked to select different types of planting spots for different sites.

You can see the effects of good microsite selection in this photograph – some trees have much better growth than others. This site is west of Prince George, where cold soils are the main growth limiting factor. The trees that are doing well were planted on natural high spots and those doing not so well were planted in depressions. **But**, if these were pine trees planted on a dry site, those planted in low spots with more available water might be doing better.

THINK MICROSITE - IT MAKES A DIFFERENCE!

Again...the difference is microsite.

The growth limiting factor for the shorter seedling is cold wet soil.

Microsite Planting

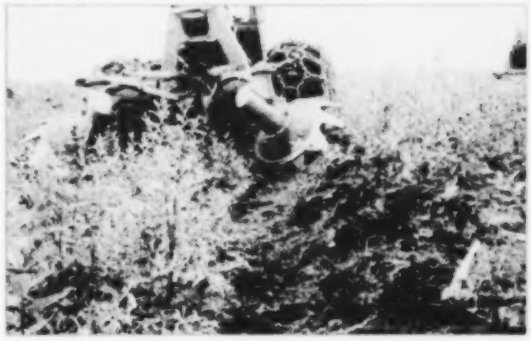
Mechanical Site Preparation

Sometimes, growth limiting factors are so severe that even the best planting spots do not provide the conditions for good seedling growth. In that case, foresters may decide to create better microsites with mechanical site preparation (MSP). MSP is done after logging but before planting, with machines that dig, plow, scrape, or mix the soil. Depending on the machine used, mounds and depressions can be created, or characteristics of the material at the soil surface can be changed.

MSP techniques are tailored to create microsites that offset the growth limiting factors. For example, on cold sites, the objective would be to create high spots to improve drainage and soil temperature. On hot, dry sites, the objective would be to create depressions, so that seedlings could have more access to soil water.

Some examples of MSP equipment and the soil profiles they create

Powered disc trencher



Soil profile

Disc trenchers create continuous furrows with a raised berm that is topped with mineral soil. They are used on cold, wet sites to create raised microsites and reduce vegetation competition. Seedlings are usually planted on the top or side of the berm.

Ripper plow

Soil profile

Ripper plows create continuous trenches with a side cast on both sides. They are used on dry sites to create microsites that conserve moisture and reduce vegetation competition. Seedlings are usually planted just above the trench towards the hinge position (see slide 4).

Some more MSP examples

Excavator mounder

Soil profile

Excavator mounders create small or large individual mounds that are capped by mineral soil. They are used on wet sites to create better drainage and increase soil temperature, and also to reduce vegetation competition. Seedlings are usually planted on the top or side of the mounds.

V-H Mulcher

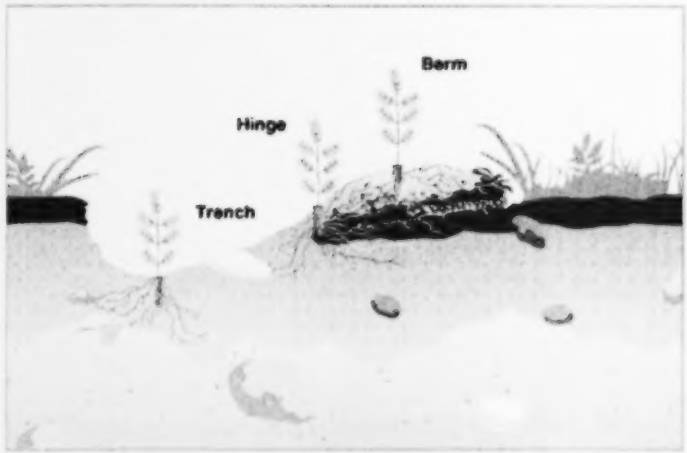
Soil profile

V-H mulchers mix mineral soil and the forest floor and create crescent shaped raised spots or depressions, depending on site conditions. The result is looser, warmer rooting conditions and some relief from vegetation competition. Seedlings are usually planted in the middle of the mulched spot.

The best microsite to plant on prepared sites varies from site to site, depending on the growth limiting factors. This illustration shows seedlings planted in three different microsites.

What would be best?
Based on the information presented in this slide show, we know that on cold, wet sites, the best microsite would be the top of the berm, on cold, but not so wet sites, the best spot would be the hinge, and on hot, dry sites, the best spot would be just above the trench towards the hinge position. However on hot dry sites with deep loamy soils the trench may be a suitable position as long as grazing cattle cannot access the site.

What's the best microsite to plant on a prepared site?



- Varies with site
- Varies across British Columbia

Your supervisor should instruct you about where to plant on each prepared site. If you have any questions – don't hesitate to ask! Its very important to take advantage of the microsites created by MSP.

Trampling Damage

Photo: Brian Wikeem, Research Branch, MoF

This photo shows a grazing cow trampling a seedling. When cattle graze in new plantations, significant damage to seedlings can occur from tram pling. Trampling damage is highest in the first two to three years following planting. On site prepared sites cattle walk along the bottom of the rows. Trampling damage can be reduced by planting seedlings up off the bottom of the trench into the hinge positio n.

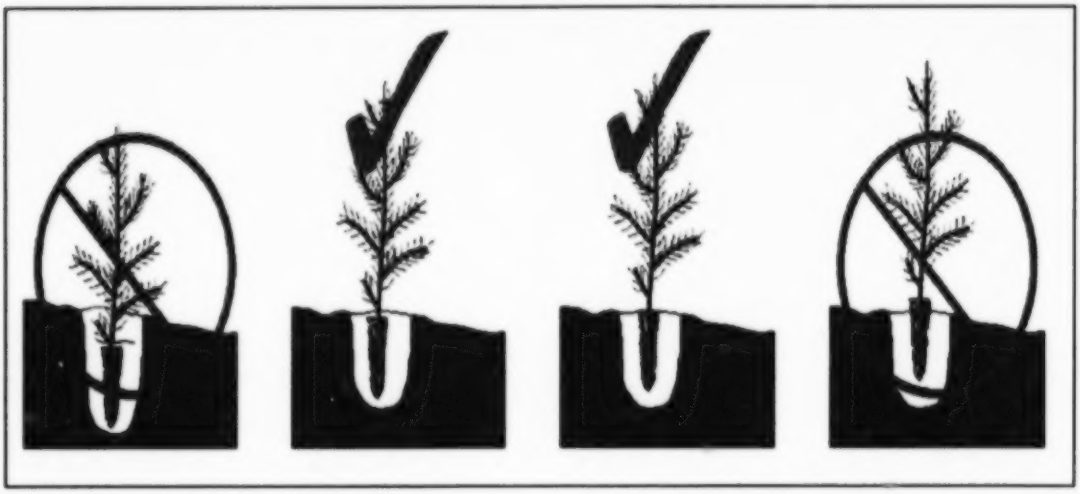
MSP is expensive - its important to take advantage of the microsites

* It is important to plant these prepared areas properly.

Here is a photo showing a seedling planted in an excavator mound, with the side cut away to show you the rooting profile. You can see that the spot is raised and free of vegetation, and that there is rich organic material for roots to grow in.

MSP is expensive, and it is important that seedlings are planted to take the best advantage of it. In this case, the seedling has been planted in the very centre of the mound, which is the microsite that is warmest, driest, and furthest away from vegetation.

How **deep** should seedlings be planted?



Seedlings should be planted neither too deep nor too shallow. Where conditions are dry, planting a **little** deep, to the bottom of the foliage, will put the roots into slightly moister soil. However, planting too deep covers up the needles and reduces the ability of the seedling to photosynthesize. Where conditions are cold and wet, plant so that the root plug is just barely covered.

This will put the roots in the warmest, driest spot. Do not leave part of the root plug sticking out of the soil - roots that are exposed to air dry out and die and the seedling will have less root area to absorb water and nutrients. Sometimes you may be told to plant all or part of the root plug in the forest floor. It's a good substrate for root growth on moist sites.

Not too deep and not too shallow!

✳ THE BOTTOM LINE ✳

- ✳ **Microsite planting is very important.**
- ✳ **If you're not sure where to plant...ask your Supervisor.**
- ✳ **The results of planting correctly will provide benefits for a long time.**